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AUTHOR Edwards, Thomas W.; And Others  
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## ABSTRACT

To improve vocational educational programs in agriculture, occupational information on a common core of basic skills within the occupational area of the retail lawn and garden center mechanic is presented in the revised task inventory survey. The purpose of the occupational survey was to identify a common core of basic skills which are performed and are essential for success in the occupation. Objectives were accomplished by constructing an initial task inventory to identify duty areas and task statements for the occupation. The initial task inventory was reviewed by consultants in the field and 258 tasks were identified. A random sample of 74 lawn and garden centers offering equipment repair services was obtained. Data were collected utilizing employer and employee questionnaires. Fifteen questionnaires were returned of which 13 were usable. A compilation of basic sample background information is presented on the size of a retail lawn and garden center, total work experience, employment at current job, and preparation as a retail lawn and garden center equipment mechanic. A compilation of duty areas of work performed and work essential for the occupation is given. Percentage performance by incumbent workers and the average level of importance of specific task statements are presented in tabular form. (Author/EC)

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**An Empirical Determination Of Tasks  
Essential To  
Successful Performance As A  
Retail Lawn And Garden Center  
Equipment Mechanic**

ED000017

AN EMPIRICAL DETERMINATION OF TASKS ESSENTIAL  
TO SUCCESSFUL PERFORMANCE AS A  
RETAIL LAWN AND GARDEN CENTER  
EQUIPMENT MECHANIC  
(SMALL ENGINE MECHANIC)

Thomas W. Edwards

Edgar P. Yoder

J. David McCracken

Department of Agricultural Education  
in cooperation with  
The Ohio State University Research Foundation  
The Ohio State University  
Columbus, Ohio

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## FOREWORD

The Department of Agricultural Education at The Ohio State University is involved in a major programmatic effort to improve the curricula in education programs in agriculture. One product in this effort is this report of the retail lawn and garden center equipment mechanic task inventory survey. The data reported were collected as part of a more comprehensive thrust designed to develop a common core of basic skills in agribusiness and natural resources.

It is hoped that the revised task inventory contained in this report will be useful to curriculum developers working for improved occupational relevance in schools. Twenty-seven additional inventories in other occupational areas are also reported from this project.

The profession owes its thanks to Tom Edwards and Edgar Yoder, graduate research associates, for their work in preparing this report.

J. David McCracken  
Project Director

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## INTRODUCTION

Occupational information is needed to develop and revise vocational and technical education curricula. Teachers and curriculum developers generally determine which skills might be taught in a program based upon teacher expertise, advisory committee input, informal and formal community surveys, and/or task inventories.

The Agricultural Education Department at The Ohio State University has utilized and revised a system for obtaining and using occupational information as an effective aid in planning, improving, and updating occupational education curricula. This report presents the results of a survey of the occupation, retail lawn and garden center equipment mechanic. The information contained herein may be used by curriculum development specialists, teachers, local and state administrators, and others involved in planning and conducting vocational and technical programs in agriculture.



### Purpose and Objectives

The major purpose of the occupational survey was to identify the skills which are performed and essential for success as a retail lawn and garden center equipment mechanic. The specific objectives of this survey were as follows:

1. Develop and validate an initial task inventory for the retail lawn and garden center equipment mechanic.
2. Identify the specific tasks performed by the retail lawn and garden center equipment mechanic.
3. Determine the relative importance of the specific tasks to successful employment as a retail lawn and garden center equipment mechanic.

### Definition of the Occupational Area

The retail lawn and garden center equipment mechanic works in privately owned businesses which repair lawn mowers and other equipment used in maintaining home landscapes. He works with the general maintenance of such equipment and complete overhaul of such equipment. In general, he will inspect and diagnose equipment malfunctions, maintain, overhaul and repair engines, power trains, steering systems, brake systems, electrical systems, and fuel systems. Additionally, he will assemble new equipment and service such equipment before it is sold. In some firms he may also be called a small engines mechanic.

### METHODOLOGY

Objectives were accomplished by constructing an initial task inventory, validating the initial inventory, selecting a sample of workers, collecting data, and analyzing data.

### Initial Task Inventory

Duty areas and task statements for the retail lawn and garden center equipment mechanic were identified by searching existing task lists, job descriptions, curriculum guides, reference publications, and service manuals. Additionally, contacts with several industry personnel aided in clarifying the specific responsibilities of the retail lawn and garden center equipment mechanic. All the tasks that the project staff thought to be performed were assembled into one composite list.

The initial tasks were grouped into functional areas called "Duties".

After the task statements were grouped under the proper duty areas, each task statement was reviewed for brevity, clarity, and consistency. In all, 315 task statements were included in the initial task inventory.

### Initial Inventory Validation

After the initial task inventory was constructed, it was reviewed by seven consultants employed in retail lawn and garden centers which offer equipment repair services to the public. These consultants were either owners-managers or small engine mechanics.

The consultants were asked to respond to the initial task list inventory by performing the following activities:

1. Indicate whether any of the tasks listed were not appropriate.
2. Add any additional tasks they believed were performed by the retail lawn and garden center equipment mechanic.
3. Make changes in the wording of tasks to help add clarity to the statements.

The comments from the seven consultants were pooled and needed revisions were made. Three duty areas were eliminated and four duty areas were combined.

As a result of the initial task inventory review process, 258 tasks were identified.

### Worker Sample Selection

Since the specific duties and tasks performed by the individual retail lawn and garden center equipment mechanic are related to the size of business where employed, an attempt was made to survey retail lawn and garden center equipment mechanics employed in various businesses across Ohio. It was not possible to secure a list of specific names and addresses of all incumbent retail lawn and garden center equipment mechanics in the state. Therefore, a sample of 74 lawn and garden centers offering equipment repair services to customers was obtained through a stratified random sampling approach. The strata used in the random sampling were type of business and geographical location. The 74 retail lawn and garden centers to be included in the survey

were randomly selected from the appropriate telephone directory yellow pages.

### Data Collection

A packet of materials was sent to the owner or manager of the randomly selected retail lawn and garden centers. The packet of materials included:

1. A cover letter from the Agricultural Education Department at The Ohio State University.
2. An employer questionnaire printed on blue.
3. An employee questionnaire printed on yellow.
4. A stamped and self-addressed return envelope.

The manager or owner was instructed to complete the employer questionnaire and to have a responsible mechanic complete the employee questionnaire. The manager or owner was instructed to collect the employee questionnaire and return both the employer and employee questionnaire in the stamped and self-addressed return envelope by the date specified in the cover letter.

A follow-up of non-respondents consisted of mailing a packet of materials two weeks after the initial mailing. The follow-up consisted of a packet of materials identical to the initial packet.

### Data Analysis

The 15 questionnaires which were returned were checked for completeness and accuracy by the project staff. Information from the 13 usable responses was coded on Fortran coding sheets for key punching. In addition to coding appropriate respondent background information, each specific task statement was coded as to whether it was performed (1 = Task performed by respondent; blank = Task not performed by respondent) and the level of importance of the task (3 = Essential; 2 = Useful; 1 = Not Important). The information was keypunched on IBM cards and verified by personnel at the Instruction and Research Computer Center at The Ohio State University.

The data was analyzed using the SOUPAC computer program and the facilities of the Instruction and Research Computer Center. Consultant assistance for analyzing the data was provided by personnel at The Center for Vocational Education. The SOUPAC computer analysis resulted in the computation of relative frequencies,

means, and rankings for each task statement. The results of the computer analyses were printed in tabular form for ease of interpretation.

## FINDINGS

Objectives of the study resulted in the compilation of basic sample background information, the determination of tasks performed by the retail lawn and garden center equipment mechanic, and the identification of tasks essential to successful performance as a retail lawn and garden center equipment mechanic.

### Description of the Sample

Information regarding the performance of tasks and the importance of the tasks to successful employment as a retail lawn and garden center equipment mechanic was obtained from retail lawn and garden center equipment mechanics in various firms across Ohio.

### Response to the Survey

A total of 74 questionnaires were mailed and 15 replies were received. This represented a 20.3% rate of return. The response to the questionnaire is summarized in TABLE I.

TABLE I

### EMPLOYEE RESPONSE TO THE QUESTIONNAIRE

	N	Percent of All Employees In the Survey
Employees in Survey	74	100.0
Total Returns	15	20.3
Usable Returns	13	17.5
Unusable Returns	2	2.8
Nonrespondents	59	79.7

### Size of Retail Lawn and Garden Center

Retail lawn and garden center equipment mechanics from various sized lawn and garden equipment centers were included in the study. The number of full-time equivalent (two one-half time mechanics equal one full-time equivalent) mechanics employed

in the firm was used as an index to assess the size of firm where the mechanic was employed. Of the 15 questionnaires received, 12 included information regarding the size of the firm. TABLE II summarizes the responses to the question, "How many full-time equivalent lawn and garden equipment mechanics are employed in your firm?" Seven mechanics or 58.6% were employed in firms employing one to two full-time equivalent mechanics. Five mechanics or 41.4% were employed in firms employing three to four full-time equivalent mechanics. Thus, 100% of the mechanics were working in firms employing one to four full-time equivalent mechanics. The average number of full-time equivalent mechanics employed in the firms was 2.3.

TABLE II

## SIZE OF LAWN AND GARDEN CENTER WHERE CURRENTLY EMPLOYED

Number of Mechanics Employed in Firm	N	Percent of Respondents
1	2	16.6
2	5	42.0
3	4	33.2
4	1	8.2
Total	12	100.0

$\bar{X}$  number of mechanics in the firm = 2.3

Total Work Experience

Retail lawn and garden center equipment mechanics with varying amounts of work experience in the lawn and garden equipment repair industry were included in the study. TABLE III summarizes the responses to the question, "How many total years have you worked in lawn and garden equipment repair work?" Five mechanics or 38.1% had from four to six total years of work experience in lawn and garden equipment repair work. Five mechanics or 38.8% had from 7-22 total years of work experience in lawn and garden equipment repair work. Two mechanics or 15.3% had from one to three total years of work experience in lawn and garden equipment repair work. The total years of work experience in lawn and garden equipment repair work ranged from 1-50 years. Mechanics had an average of 11.8 years of total work experience in lawn and garden equipment repair work.

TABLE III  
TOTAL AMOUNT OF WORK EXPERIENCE IN  
LAWN AND GARDEN CENTER EQUIPMENT REPAIR WORK

Years	N	Percent of Respondents
1-3	2	15.3
4-6	5	38.1
7-10	1	7.8
11-14	1	7.8
15-18	2	15.4
19-22	1	7.8
23 or more	1	7.8
Total	13	100.0

$\bar{X}$  years in lawn and garden center equipment repair  
work = 11.8

#### Employment at Current Job

Retail lawn and garden center equipment mechanics in the survey had spent varying amounts of time in their present job. TABLE IV summarizes the responses to the question, "How many years have you worked at your present job?" Five mechanics or 38.0% had worked at their present job from four to six years. Four mechanics or 30.8% had worked at their present job from one to three years. The years of work at their present job ranged from 1-18 years. Mechanics had been employed at their present job an average of 6.9 years.

#### Preparation as a Retail Lawn and Garden Center Equipment Mechanic

Retail lawn and garden center equipment mechanics obtained training for their job from various sources. TABLE V summarizes their responses to the question, "Where did you receive your training as a mechanic?" Thirteen mechanics or 100% indicated they received training on-the-job. Three mechanics or 23.0% indicated they attended a company school or course to receive training as a mechanic. Four mechanics or 30.7% indicated they had received training as a mechanic by attending a high school and/or technical school program in mechanics.



TABLE IV  
LENGTH OF TIME AT PRESENT JOB

Years	N	Percent of Respondents
1-3	4	30.8
4-6	5	38.0
7-10	1	7.7
11 or more	3	23.5
Total	13	100.0

$\bar{X}$  years at present job = 6.9

TABLE V  
SOURCE OF TRAINING RECEIVED AS A  
RETAIL LAWN AND GARDEN CENTER EQUIPMENT MECHANIC

Source	N	Percent of All Employees In the Survey
On-The-Job	13	100.0
High School Program	3	23.0
Technical School Program	1	7.7
Company School/Course	3	23.0
Military Training	1	7.7
Other	1	7.7

Duty Areas of Work Performed by the Retail Lawn and  
Garden Center Equipment Mechanic

The 258 tasks were grouped under twenty-three duty areas. Each respondent indicated whether he performed the specific task in his current position as a retail lawn and garden center equipment mechanic. The percentages of respondents performing each task were averaged for all tasks under each duty area. The mean percentage of incumbents who performed specific tasks in specified duty areas is presented in TABLE VI.

Duty areas of work in which 50% or more of the incumbent workers performed the tasks were:

1. Performing General Office Procedures
2. Recording Information
3. Following General Safety Precautions
4. Pre-Delivery Servicing of Equipment
5. Using and Maintaining Hand and Power Tools
6. Operating Equipment
7. Using and Maintaining Service Manuals
8. Picking-Up and Delivering Equipment
9. Assembling Equipment
10. Inspecting and Diagnosing Malfunctions
11. Repairing and Maintaining Braking Systems
12. Repairing and Maintaining Wheels and Tires
13. Repairing and Maintaining the Steering System
14. Repairing and Maintaining the Power Train
15. Repairing and Maintaining Hydraulic Systems
16. Repairing and Maintaining the Ignition, Charging, and Starting System
17. Repairing and Maintaining Electrical Accessories
18. Overhauling and Maintaining Engines
19. Repairing and Maintaining Governor Systems
20. Repairing and Maintaining Oil Lubrication Systems
21. Repairing and Maintaining the Cooling System
22. Repairing and Maintaining Gas Fuel Systems
23. Repairing Lawn and Garden Equipment

Duty Areas of Work Essential for Successful  
Performance as a Retail Lawn and Garden Center  
Equipment Mechanic

A level of importance rating was obtained for each task. The respondent could rate the task as essential, useful, or not important for successful performance as a retail lawn and garden center equipment mechanic. A ranking of essential was assigned a numerical rating of "3", useful a numerical rating of "2", and not important a numerical rating of "1". The level of importance ratings for each task were averaged for all tasks under each duty area. The average level of importance ratings for the specific tasks in the specified duty areas are presented in TABLE VI.

Duty areas of work which received a 2.0 or higher level of importance rating by incumbent workers were:

1. Performing General Office Procedures
2. Recording Information
3. Following General Safety Precautions



4. Pre-Delivery Servicing of Equipment
5. Using and Maintaining Hand and Power Tools
6. Operating Equipment
7. Using and Maintaining Service Manuals
8. Picking-Up and Delivering Equipment
9. Assembling Equipment
10. Inspecting and Diagnosing Malfunctions
11. Repairing and Maintaining Braking Systems
12. Repairing and Maintaining Wheels and Tires
13. Repairing and Maintaining the Steering System
14. Repairing and Maintaining the Power Train
15. Repairing and Maintaining Hydraulic Systems
16. Repairing and Maintaining the Ignition, Charging, and Starting System
17. Repairing and Maintaining Electrical Accessories
18. Overhauling and Maintaining Engines
19. Repairing and Maintaining Governoring Systems
20. Repairing and Maintaining Oil Lubrication Systems
21. Repairing and Maintaining the Cooling System
22. Repairing and Maintaining Gas Fuel Systems
23. Repairing Lawn and Garden Equipment

Percentage Performance and Level of Importance  
Ratings of Specific Tasks

The percentage performance by incumbent workers and the level of importance for each specific task is also presented in TABLE VI.

It is recommended that the results for each specific task be examined by educators and others who are developing educational programs to determine curriculum content for preparing retail lawn and garden center equipment mechanics. Specific tasks with a high level of performance and a high level of importance rating should be given more emphasis in the educational program than specific tasks with a low level of performance and a low level of importance rating.

TABLE VI

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PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE \*  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
<b>Performing General Office Procedures</b>		
File office forms. . . . .	35	1.6
Meet people. . . . .	78	2.8
Use telephone. . . . .	85	2.8
Write memos and notes. . . . .	78	2.4
File service manuals . . . . .	85	2.7
Mean Rating. . . . .	72.2	2.4
<b>Recording Information</b>		
Record information on work or job sheets . . . . .	85	3.0
Mean Rating. . . . .	85.0	3.0
<b>Following General Safety Precautions</b>		
Apply first aid to minor cuts, bruises, and burns. . . . .	78	2.4
Follow safe work habits. . . . .	85	2.9
Identify potential safety hazards. . . . .	78	2.6
Store chemicals. . . . .	42	1.9
Use fire extinguishers . . . . .	71	2.8
Wear proper protective clothing. . . . .	71	2.6
Ventilate work areas . . . . .	85	2.9
Interpret information on labels and signs. . . . .	78	2.8
Use proper lifting and carrying methods. . . . .	92	2.8
Store inflammable materials. . . . .	64	2.1
Wear proper work clothes . . . . .	85	2.6
Adjust safety devices. . . . .	85	2.9
Install safety devices . . . . .	92	2.7
Correct potential safety hazards . . . . .	92	2.8
Remove debris from work areas. . . . .	92	2.8
Use electrical connectors and safety devices . . . . .	85	2.6
Mean Rating. . . . .	79.6	2.6
<b>Pre-Delivery Servicing of Equipment</b>		
Grease equipment . . . . .	92	2.9

\*Average rating of importance may range from 1-3 with 3 being the highest

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Inflate tires. . . . .	92	2.9
Adjust belts . . . . .	92	2.9
Adjust chains. . . . .	92	2.9
Oil equipment. . . . .	78	2.7
Mean Rating. . . . .	89.2	2.8
Using and Maintaining Hand and Power Tools		
Adjust tools . . . . .	85	2.6
Clean tools. . . . .	92	2.2
Identify tools . . . . .	85	2.7
Interpret tool operation instructions. . . . .	85	2.6
Recondition broken hand tools. . . . .	78	2.1
Select proper tools for specific jobs. . . . .	92	3.0
Sharpen tools and blades . . . . .	92	2.8
Store tools. . . . .	78	2.5
Use hand tools safely. . . . .	92	3.0
Use power tools safely . . . . .	92	2.9
Set up tools . . . . .	78	2.4
Mean Rating. . . . .	86.2	2.6
Operating Equipment		
Interpret gauges on equipment. . . . .	92	2.9
Adjust safety shields. . . . .	92	3.0
Correct potential equipment safety hazards . . . . .	92	2.8
Interpret equipment safety symbols . . . . .	92	2.9
Identify potential equipment safety hazards. . . . .	85	2.9
Operate equipment under work situations. . . . .	92	2.7
Refuel engine units. . . . .	63	2.6
Mean Rating. . . . .	86.8	2.8
Using and Maintaining Service Manuals		
Locate proper specifications for equipment . . . . .	92	3.0
Locate proper manuals for specific equipment . . . . .	92	3.0

TABLE VI (Cont.)

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PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Interpret sketches and diagrams. . . . .	92	2.9
Follow written repair instructions . . . . .	92	2.9
Mean Rating: . . . . .	92.0	2.9
<b>Picking-Up and Delivering Equipment</b>		
Complete delivery report . . . . .	78	2.2
Select proper delivery routes. . . . .	64	2.0
Secure equipment on trucks . . . . .	78	2.4
Load and unload equipment on trucks. . . . .	85	2.5
Describe use of operator's manual to buyers. . . . .	78	2.6
Describe general equipment operating procedures to customers . . . . .	85	2.7
Describe general equipment maintenance procedures to customers . . . . .	85	2.6
Mean Rating: . . . . .	79.0	2.4
<b>Assembling Equipment</b>		
Install belts. . . . .	92	3.0
Install chains . . . . .	92	2.9
Install controls . . . . .	85	2.9
Check packing slip against parts and hardware in bundles . . . . .	59	2.6
Follow written assembly instructions . . . . .	71	2.6
Identify and use proper hardware to assemble equipment . . . . .	92	2.9
Inspect assembled equipment for operating defects. . . . .	92	2.9
Interpret assembly diagrams. . . . .	92	2.3
Use proper tools and equipment to assemble . . . . .	92	2.9
Separate hardware items into piles . . . . .	50	2.1
Arrange parts for ease in assembly . . . . .	85	2.4
Tighten bolts in proper sequence . . . . .	85	2.8
Inspect parts for damage . . . . .	92	2.9
Mean Rating: . . . . .	83.0	2.7
<b>Inspecting and Diagnosing Malfunctions</b>		
Determine how breakages and defects in certain parts influence operation of equipment. . . . .	92	2.7

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Determine potential causes of equipment failure from customer's description . . . . .	92	2.5
Diagnose potential causes of equipment failure from symptoms observed . . . . .	92	2.5
Visually inspect for defects . . . . .	92	2.8
Interpret maintenance procedures for customers to prevent operating defects . . . . .	92	2.5
Recommend appropriate parts needed to correct malfunctions . . . . .	92	2.9
Follow troubleshooting procedures in service manuals . . . . .	85	2.8
Operate equipment to identify problems . . . . .	85	2.7
Connect, operate, and disconnect testing equipment . . . . .	92	3.0
Mean Rating. . . . .	90.4	2.7
Repairing and Maintaining Braking Systems		
Adjust mechanical brakes . . . . .	92	2.6
Inspect brake disk, backing plate, and pressure plates . . . . .	78	2.6
Replace brake lining . . . . .	78	2.4
Remove and install brake shoes and disks . . . . .	92	2.6
Test brakes after adjustment . . . . .	92	2.6
Mean Rating. . . . .	86.4	2.5
Repairing and Maintaining Wheels and Tires		
Add wheel weights. Δ . . . . .	64	2.2
Adjust wheel bearings . . . . .	78	2.6
Inflate tires . . . . .	92	2.9
Inspect bearings and seals . . . . .	92	2.9
Patch tubes . . . . .	85	2.2
Repack wheel bearings . . . . .	92	2.9
Replace wheel bearings and seals . . . . .	92	3.0
Mean Rating. . . . .	85.0	2.6
Repairing and Maintaining the Steering System		
Adjust worn steering gear bearings . . . . .	85	2.9
Remove and install ball joints . . . . .	85	2.9

TABLE VI (Cont.)

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PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Remove and install tie rods. . . . .	92	2.8
Replace steering gears and knuckles. . . . .	92	2.9
Mean Rating. . . . .	88.5	2.9
Repairing and Maintaining the Power Train		
Replace clutch linkage parts. . . . .	92	2.9
Check and adjust clutch pedal free travel. . . . .	85	2.6
Check and adjust end-play on gears and shafts. . . . .	92	2.9
Check and adjust gear backlash. . . . .	78	2.2
Identify gear tooth wear and failures. . . . .	71	2.4
Determine purpose of power train parts. . . . .	78	2.5
Evaluate how dirt influences tooth and gear wear. . . . .	71	2.4
Identify parts of the power train. . . . .	92	2.8
Drain, flush, and refill transmission. . . . .	92	2.9
Pack bearings. . . . .	92	3.0
Replace oil seals in power train. . . . .	92	2.9
Open and close transmission housing. . . . .	92	2.9
Remove and install shafts. . . . .	92	3.0
Replace bearings in power train. . . . .	92	3.0
Replace transmission oil filter. . . . .	85	2.6
Replace gaskets in power train. . . . .	92	3.0
Remove and install differential. . . . .	92	2.9
Replace ring gear and pinion. . . . .	92	2.9
Remove and install rear axles. . . . .	92	2.9
Replace axle oil seals. . . . .	92	3.0
Install and adjust drive belt. . . . .	92	3.0
Mean Rating. . . . .	88.0	2.6
Repairing and Maintaining Hydraulic Systems		
Add hydraulic oil to system. . . . .	92	2.9
Bleed hydraulic system. . . . .	78	2.6
Determine purpose of hydraulic system parts. . . . .	78	2.6
Diagnose pump failures. . . . .	78	2.6
Drain, flush, and refill hydraulic system. . . . .	85	2.8
Evaluate influence contaminants have on operation of system. . . . .	64	2.4
Identify parts of hydraulic system. . . . .	78	2.6

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Install O-rings, seals, and packing. . . . .	78	2.8
Locate internal and external leakage problems. . . . .	78	2.6
Install hydraulic hose and tubing. . . . .	85	2.9
Remove and install hydraulic pumps . . . . .	85	2.9
Replace cylinders. . . . .	85	2.9
Replace hydraulic oil filters. . . . .	85	2.9
Mean Rating. . . . .	80.6	2.7
Repairing and Maintaining the Ignition, Charging, and Starting System		
Check for spark. . . . .	92	3.0
Check specific gravity of battery. . . . .	92	2.9
Check timing. . . . .	92	2.9
Clean starter drives . . . . .	92	2.9
Test generator output for amperage, voltage, and resistance. . . . .	85	2.7
Conduct regulator current test . . . . .	85	2.7
Conduct regulator voltage test . . . . .	85	2.7
Determine purpose of parts in system . . . . .	85	2.9
Identify parts of system . . . . .	92	2.9
Inspect breaker points . . . . .	92	3.0
Inspect for poor electrical connections. . . . .	92	2.9
Inspect spark plugs. . . . .	92	3.0
Inspect switches . . . . .	92	2.9
Remove and install points. . . . .	92	3.0
Install and adjust generator belts . . . . .	85	2.8
Install and adjust spark plugs . . . . .	92	3.0
Install and service battery. . . . .	92	2.9
Make no load test on starter . . . . .	78	2.5
Polarize generator . . . . .	85	2.6
Remove and install generator . . . . .	85	2.8
Remove and install regulator . . . . .	85	2.8
Remove and install starter . . . . .	92	3.0
Test coil. . . . .	92	2.9
Test condensor for resistance, leakage, and capacity . . . . .	92	2.7
Test ignition system for open circuits, grounds, and resistance. . . . .	92	2.8
Time ignition system to engine. . . . .	92	2.9
Unlock starter. . . . .	85	2.6



TABLE VI (Cont.)

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PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Wire the starting, ignition, and charging circuits . . . . .	92	2.9
Replace starter rope . . . . .	85	2.8
Adjust coil air gap on small engines . . . . .	85	2.8
Replace starter spring on rope rewind starter. . . . .	78	2.8
Test starter armature and field coils. . . . .	78	2.5
Test alternator diodes . . . . .	85	2.6
Replace alternator diodes. . . . .	78	2.3
Replace ignition switch or controls. . . . .	92	2.7
Replace spark plug wires . . . . .	92	2.7
Mean Rating. . . . .	88.1	2.8
Repairing and Maintaining Electrical Accessories		
Install wiring . . . . .	92	2.8
Repair broken electrical wires . . . . .	92	2.9
Replace circuit breakers . . . . .	78	2.6
Replace fuses. . . . .	92	2.9
Replace gauges . . . . .	85	2.9
Replace light bulbs. . . . .	92	2.9
Replace switches . . . . .	92	2.9
Test circuits for shorts, grounds, and open circuits . . . . .	92	2.9
Test operation of gauges . . . . .	85	2.9
Mean Rating: . . . . .	88.8	2.8
Overhauling and Maintaining Engines		
Adjust valve clearance . . . . .	92	3.0
Check compression. . . . .	92	2.9
Clean engine and engine parts. . . . .	92	2.9
Clean head . . . . .	92	2.9
Clean oil and water passages . . . . .	85	2.9
Deglaze cylinders. . . . .	92	2.9
Determine function of engine parts . . . . .	92	2.9
Grind valves . . . . .	92	2.9
Identify parts of engine . . . . .	92	3.0
Install head gasket. . . . .	85	3.0
Install valve guides . . . . .	85	2.9



PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Inspect and measure camshaft bushings. . . . .	78	2.4
Inspect and measure valve seats. . . . .	92	2.9
Inspect and replace gaskets. . . . .	92	3.0
Inspect and replace valve springs. . . . .	92	2.9
Inspect camshaft and measure camshaft tolerances . . . . .	92	2.8
Inspect crankshaft and measure tolerances. . . . .	92	2.9
Inspect cylinders and measure cylinder bore. . . . .	92	2.9
Inspect engine block . . . . .	92	2.9
Inspect head and head gasket for defects . . . . .	92	2.9
Inspect main bearings and measure main bearing clearance . . . . .	92	3.0
Inspect connecting rods and measure rod bearing clearance. . . . .	92	3.0
Inspect pistons and measure piston tolerances. . . . .	92	3.0
Inspect piston pins and measure pin tolerances. . . . .	92	2.9
Inspect piston rings and measure piston ring tolerances. . . . .	92	2.9
Lap valves . . . . .	78	2.6
Measure camshaft end play. . . . .	78	2.4
Measure crankshaft end play. . . . .	92	2.9
Measure valve guide tolerances . . . . .	92	2.8
Reface valve seats . . . . .	85	2.6
Remove and install camshaft. . . . .	92	3.0
Remove and install camshaft bushings . . . . .	64	2.4
Remove and install camshaft gear . . . . .	85	2.9
Remove and install crankshaft. . . . .	92	2.9
Remove and install engine. . . . .	92	2.9
Remove and install oil seals . . . . .	92	3.0
Remove and install head. . . . .	92	3.0
Remove and install piston assembly . . . . .	92	2.9
Remove and install piston rings. . . . .	92	2.9
Remove and install piston pins . . . . .	92	2.9
Remove and install oil pan . . . . .	92	2.9
Remove and install valves. . . . .	92	3.0
Remove and install valve seat inserts. . . . .	71	2.4
Remove and install timing chain. . . . .	57	2.4
Remove and install rod bearing inserts . . . . .	71	2.4
Remove cylinder ridge. . . . .	85	2.9
Remove or add shims. . . . .	78	2.8
Remove and replace main bearings . . . . .	78	2.7
Remove and install flywheel. . . . .	92	3.0
Time valve assembly. . . . .	85	2.9
Torque rod bearing caps. . . . .	92	3.0

TABLE VI (Cont.)

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PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Torque main bearings . . . . .	85	2.9
Torque head bolts . . . . .	92	3.0
Make reed-stop plate adjustment . . . . .	85	2.9
Install and ream crankshaft bushings . . . . .	64	2.3
Remove and install reed valves . . . . .	92	2.9
Mean Rating . . . . .	85.6	2.8
Repairing and Maintaining Governing Systems		
Adjust for proper engine speed . . . . .	92	3.0
Inspect parts of governor for defects . . . . .	92	2.9
Remove and install governors . . . . .	92	2.9
Replace parts of governors . . . . .	92	3.0
Mean Rating . . . . .	92.0	2.9
Repairing and Maintaining Oil Lubrication Systems		
Add oil to engines . . . . .	92	3.0
Change oil and oil filters . . . . .	92	3.0
Remove and install oil pump or oil slingers . . . . .	85	2.6
Mean Rating . . . . .	89.0	2.8
Repairing and Maintaining the Cooling System		
Clean debris from cooling fins . . . . .	92	3.0
Mean Rating . . . . .	92.0	3.0
Repairing and Maintaining Gas Fuel Systems		
Adjust carburetors . . . . .	85	3.0
Clean carburetors . . . . .	92	3.0
Clean sediment bowl and screen . . . . .	92	3.0
Determine purpose of various parts . . . . .	92	2.9
Identify parts of fuel system . . . . .	92	2.9
Install carburetor repair kit . . . . .	92	2.9
Remove and install fuel tanks . . . . .	92	2.9

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE  
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Remove and install fuel pump . . . . .	85	2.7
Remove and install manifolds . . . . .	92	2.6
Replace fuel filters . . . . .	85	2.7
Replace fuel lines . . . . .	92	2.9
Replace needle bearings . . . . .	85	2.7
Service air cleaner . . . . .	92	2.8
Test fuel pump . . . . .	78	2.6
Mean Rating . . . . .	89.0	2.8
Repairing Lawn and Garden Equipment		
Cut metal . . . . .	71	2.1
Heat and bend metal . . . . .	71	2.1
Identify various metals . . . . .	71	1.9
Operate arc welder . . . . .	64	2.3
Operate oxy-acetylene welder . . . . .	71	2.3
Prepare and fit metal to be welded . . . . .	71	2.3
Weld metal . . . . .	71	2.2
Mean Rating . . . . .	70.0	2.1